Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant To the Satellite Home Viewer Extension and Reauthorization Act	)	ET Docket No. 05-182
	)	
	)	

Response by May 18, 2005

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In the Commission's request for comments, it raises a number of issues which are significant to the carriage of digital signals from a distant market into an area which may or may not be served with a satisfactory quality signal even within the grade-b contour of a local station. Among the issues the commission has raised, or apparently has raised, is whether a statistical estimate or computer-based analysis system is adequate for determining signal strength for grade-b coverage or whether other methods are necessary.

In this respondent's opinion, more needs to be taken into account than the theoretical or expected reception level which general engineering estimates would apparently indicate is adequate to supply a level of signal adequate for reception.

While the Commission has provided that for certain classes of communications, local authorities (including land owners and condominium associations as well as cities and states, by statute) may not prohibit or restrict the use of certain devices (such as small satellite dishes), or require use of someone else's facilities (such as in the case of use of unlicenced wireless spectrum for construction of computer networks), there are permissible restrictions such as not permitting device installation in areas the party wishing to install the device does not have ownership or control over (such as making it permissible to prohibit installing a satellite dish in a common area of a condominium complex.)

The issue of where a digital antenna may be installed as well as the type of antenna which may be installed is relevant. Antennas do not always vary in quality simply on the basis of price; sometimes inexpensive antennas from one manufacturer may do a better job at providing an adequate quality signals over antennas from other manufacturers which are more expensive.

Also, while engineering analysis may dictate that signal quality is adequate in a specific area, a

pure engineering analysis may miss real world conditions that dictate otherwise.

It is one thing to determine that by engineering analysis that an area is reasonably within a satisfactory quality grade-b signal, it's another to discover the engineering analysis is flawed because it presumes customers can install outdoor antennas, a practice which may not be available.

Measurements may, and in fact should, take into account differences between densely populated urban areas, and lightly populated rural areas.

The Commission should take into account the classification of the general environment of a particular class of coverage, in that, for example, in a dense urban area, most people may be living in multi-story apartment buildings or in condominium complexes and may be unable to install an external antenna, either because they have no access right to any outdoor space (as in the case of someone living in a condominium that has no private yard) or because they have no outdoor space at all (someone living in a multistory apartment building without a balcony.).

Where engineering estimates would probably show that yes, a satisfactory quality signal is available within the grade-b contour, such estimates must take into account that for a particular area, most if not all antennas may be indoor only. If a person lives in a multi-story building and their apartment does not have a balcony, an external antenna clearly is impossible and this should be taken into account.

In allowing a station to exclude distant signals the onus should be on the local station to show that it is able to supply adequate signal quality within the grade-b contour on the basis of actual measurements that realistically match real-world conditions of a majority of persons who would allegedly receive their signal.

In determining signal measurement, an equivalent number of actual measurement points should be required relative to some percentage figure relative to the general population of the area which it is claimed by the station to be able to receive its signal, and the reception points should be such that they are in multiple areas of the grade-b contour region, such that whatever measurement is made is a fair representation of what generally should be expected of persons using receiving equipment in the grade-b region.

For example, if an estimate of 1% of the population of the grade-b contour is considered what is necessary to be selected, and the estimated population of that particular region, based on engineering estimates of signal strength, indicates that 150,000 people live in that region, then the station should be required to collect 1500 measurements. Such measurements, ideally, would be from the fringe points of what is claimed to be the edge of the grade-b contour, as well as measurements within the contour. Quite possibly, a random selection of points may be more appropriate.

Such measurements, where made, should be as close to real-world conditions as would be

expected, presumably, by asking residents who live at the selected or computed points, to allow the party performing the measurements to do so from within their home. It is quite likely that people will be delighted to participate, as most people would prefer to have someone see if they are not receiving adequate reception. As such testing probably would run no more than 5 minutes or so, the request would not be overly burdensome for the home's resident.

In the conducting of such tests, a range of antennas should be required. The Commission should survey electronics, home repair and television stores, either by visit, by examining regular advertising materials, or by telephone call, the range and price of available antennas suitable for this purpose.

The Commission should probably perform an engineering analysis of several brands and types of antennas, with a view in most cases to using the least expensive model of antennas that are generally available for commercial purchase, as well as the antennas that tend to be of less quality over higher quality.

The Commission should then show which brands of antennas it used and recommend these for testing purposes.

The reason for this rationale is that most people purchasing electronic equipment are not technically sophisticated. They will probably presume all antennas are the same and purchase either the least expensive or that are the least intrusive looking in terms of appearance.

Also, if testing is done with inexpensive and low quality antennas, and the quality of reception levels are still adequate, then anyone using more expensive or higher quality antennas could reasonably be expected to have equal or better results.

Stations may also be permitted to use more expensive and/or better quality antennas in addition to the above testing factors to show that their signal is reasonably accessible, as long as the price of the antenna is within a reasonable range of typical prices for retail purchase of antennas.

The same provisions should apply to digital receivers and digital television sets.

The commission should also examine issues of the difference between reception using a digital to analog adapter, and an actual television set capable of digital reception, as there may be differences between reception in both cases even where the two devices come from the same manufacturer.

Also, it should be noted most people are unlikely to be willing to discard perfectly satisfactory analog television sets in order to purchase expensive digital televisions that currently do not really provide any significant improvement in picture quality at this time.

The Commission should also provide for the invalidation of a station's claim of adequate reception based on some criteria showing the data provided to have too much error. For

example, if a third party takes similar measurements at identical or near-identical points as the station did, and finds that over some number of measurements provide lower quality or unsatisfactory quality signal (for example, let's use 5%, meaning that of the 1500 measurement points given in the above example, if more than 5% are incorrect, or 75 do not provide the same reading) then the station's measurement claiming satisfactory quality signal levels are being received in the grade-b contour should be considered invalid and a privilege to exclude distant signals be revoked for some period, until new measurements which correct these errors has been made and recertified by the station or the company that performed the tests for the station.

The period could be some factor such as six months from when a new measurement causes decertification of a station's test results, or until new results are certified, whichever is later. This would give an incentive for stations to make sure the evidence they provide is correct, as if it is found to have errors, they lose the privilege of mandating exclusivity from distant signals for at least six months.

A third party should be permitted to present the evidence to the Commission which will then allow the television station to rebut such evidence provided to show otherwise. In the event the station does not satisfactorily rebut the evidence, the original test shall be considered invalid and distant stations may be received by persons in the area where the failed test occurred.

The Commission may set range limits for invalidating test results, such that where a test is made it may simply invalidate those areas of grade b coverage and points beyond them until 6 months later or a recertified test result is made, whichever is later, or it may invalidate the entire test, or whatever it determines is the best choice under the circumstances.

Also, the results of such tests and any potential defeating claims should be considered part of the material made available by a station as part of its license and other records that are subject to public inspection in order that other parties have access to the data the station is using in the event they wish to confirm whether the test results available are or are not valid..

Respectfully Submitted,

Paul Robinson
"A computer programmer and Notary Public
in and for the Commonwealth of Virginia, at large."
General Manager
Robinson Telephone Company

May 18, 2005

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To the Satellite Home Viewer Extension and	)	
Reauthorization Act		

June 17, 2005

Response by:

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Viamorph, Inc. submits these comments in reply to the Notice of Inquiry ET Docket No. 05-182, In the Matter of Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant To the Satellite Home Viewer Extension and Reauthorization Act.

About Viamorph

Viamorph Inc. is a manufacturer and licensor of antenna technologies with applications in digital television. Viamorph is introducing to the consumer marketplace a new class of antennas that automatically adjusts their electrical shapes in response to changes in environment and signal conditions so as to maintain optimal performance at all times. This new technology, which we call DiSA™ (Digital Smart Antenna), is embodied in an antenna that can change virtually all of its electrical characteristics including gain, pattern and beamwidth. DiSA™ antennas operate in conjunction with receiver resident software which performs the signal analysis and controls the antenna configuration.

Introductory Comments

In order to assess the DTV experience from the consumer viewpoint, Viamorph conducted an extensive review of the comments available at numerous internet fora such as www.avsforum.com and product reviews at sites like www.circuitcity.com. As it is rare for reviewers to state all the particulars of their equipment and location etc., our methodology was necessarily simple - we assigned comments and reviews into broad subjective categories. Nonetheless, we believe that those sources are a wealth of

valuable qualitative information regarding the DTV experience. In addition, we distributed a more structured questionnaire via a few of the fora. Our comments are based in part on the conclusions derived from all of those activities.

Some results of our research:

- For any particular antenna, customer reviews ran the gamut from very negative to very positive. A negative review is one in which the reviewer makes an explicit recommendation against the product and/or reports less than complete ability to receive all the local stations. While reviewers rarely indicated whether they were in urban, suburban or exurban environments we note that many reviewers indicated an ability to receive all the analog signals available to them but not all the digital signals.
- Many reviewers reported complete satisfaction with their antennas, stating they were able to receive all the available digital signals with minimum effort.
- Reviewers frequently report the need to make nearly continuous adjustments to their antennas, especially (but not only) when changing channels.
- Many reviewers have tried at least two antennas, some going through three or more, and still had varying degrees of success.
- Conflicting reviews were prevalent. For every antenna recommendation other reviewers reported that it didn't work for them.

We are also pleased to provide the Commission with comments due to a study conducted by Viamorph's Vice-President of Research and Development, John Ross, Ph.D., PE. Dr. Ross is an expert in applied electromagnetics and specializes in computer analysis, and design of vehicular antennas, wideband, and re-configurable antennas. While Dr. Ross was able, eventually, to receive *most* of the available DTV channels in Salt Lake City, Utah, it is clear that the level of expertise and effort required to do so is beyond the vast majority of consumers.

We also recommend Dr. O. Bendov's 1999 paper "On the Validity of the Longley-Rice (50,90/10) Propagation Model For HDTV Coverage and Interference Analysis" which documents the numerous shortcomings of the ILLR and the 50/90/10 methods. The paper is available at http://www.dielectric.com/broadcast/longley-rice.asp. His conclusion: "Analysis of the available field test results coupled with key theoretical considerations shows that a modification of the LR model will be required before it could be effectively used for HDTV coverage and interference prediction." The consumer experience has shown that this conclusion may be an understatement.

Among our conclusions based on the above, we believe that any predictive model must include methods to account for the wide and frequently unpredictable performance of the antennas available to consumers.

Comments to the specific items of the Notice

The Commission states in item 6 of the Notice, "*These criteria presume that households will exert similar efforts to receive DTV broadcast stations as they have always been expected to exert to receive NTSC analog TV signals.*" Our research indicates the level of effort (and not incidentally, expense) required for consumers to receive DTV signals OTA is often considerably greater than that required for analog signals. In our comments below we supply considerable justification for this conclusion.

With regard to item 7 of the Notice, Dr. Ross supplies the following comment:

> *This seems to be a significant issue based on my experience here in downtown Salt Lake City. My existing analog television service is very good. These signals are received via a directional outdoor antenna (with rotator). Despite the fact that the system performs very well for analog television, it did not perform well with a DTV receiver. Specifically, I found*

that the first time I connected the receiver to this antenna system the DTV receiver did not find a single one of the 10 available stations during the channel scan process.

With regard to item 9 of the Notice , our research indicates that aiming and antenna directivity issues are critical for many, if not most, consumers. Consider this typical comment at www.avsforum.com:

Some around here (No Va) can use the wider beam to get Balt and Wash without a rotator. Others will suffer multipath from that. Bite the bullet and call in the pros.

Respondents to our questionnaire also typically indicated the need to reorient their antenna in order to receive various channels and even then, respondents were frequently unable to receive all the DTV channels in their area.

Consider too, the article by Philip Yam in the June 2005 issue of *Scientific American* magazine, subtitled 'Receiving HDTV over the air takes luck and lots of patience'. The article opens

Keep the antenna level. Rotate it 90 degrees. Move it a few inches to the left. Stand to the right. Hold it a bit higher & there--nope. Try again.

We conclude that a fixed antenna is not a viable DTV antenna solution for many consumers. We further note that aiming is more difficult for DTV than for NTSC. According to the FCC's definitions, the difference in Signal-to-Interference ratio (SIR) between an unusable and a (merely) passable NTSC picture is approximately 20 dB. This allows a consumer to see gradual improvement or reduction in picture quality as he makes antenna adjustments, and makes it easy for him to optimize antenna orientation. In ATSC, the difference in SIR between an unusable and an excellent picture is less than 5dB, which makes it difficult for the consumer to see the effect of his antenna adjustments. As the consumer adjusts his antenna to receive a signal, he will often see no picture until he happens to orient the antenna in a direction in which the SIR exceeds Threshold of Visibility (TOV), and once this happens he may have no way of maximizing the SIR above TOV. As a result, the antenna may be oriented in a direction where the SIR is marginally above that required for TOV, and any reduction in signal strength due to the motion of people or vehicles, or changes in atmospherics will cause a loss of picture. And, of course, this adjustment procedure must be repeated for ATSC channels received from different directions. Frequently, the aiming operation must occur every time the viewer changes the channel.

With regard to items 10 and 11 of the Notice, we believe that the assumptions regarding the receiving system are unrealistic. We are unaware of any antenna available to consumers to date, at any price, which is optimized on a channel by channel basis as is the test antenna. Additionally, assuming optimal antenna orientation necessarily implies a rotor or other consumer controlled pointing mechanism. We have commented elsewhere that antenna aiming is considerably more important and difficult for DTV than for NTSC. The assumption that a receiving antenna may be optimally oriented is therefore unrealistic.

We also note that the gain of an antenna is additionally dependent on the intended frequency and bandwidth of operation. The Commission is aware that reception of distant signals usually calls for an antenna system with multiple elements, each designed for use at certain frequencies. For example, many, if not most, outdoor antenna installations incorporate separate elements for UHF and VHF reception. While those antennas are designed to provide the best gain performance in the intended *band* of operation, their gain performance at any *particular* frequency is lower than an optimal antenna *for that particular frequency*. The assumption that the receiving antenna is optimally chosen for frequency is therefore also unrealistic.

With regard to item 11 of the notice, Viamorph is introducing to the consumer marketplace a new class of antennas that automatically adjusts their electrical shapes in response to changes in environment and signal conditions so as to maintain optimal performance at all times. This new technology, which we call

DiSA™ (Digital Smart Antenna) is embodied in an antenna that can change virtually all of its electrical characteristics including gain, orientation and pattern as required. DiSA™ antennas operate in conjunction with receiver resident software which performs the signal analysis and controls the antenna configuration. The DiSA™ antenna solves most of the other thorny problems inherent in making a predictive model which must of necessity include consideration of antenna characteristics.

The Commission is aware of the fact that currently available antennas are designed for optimal operation at certain frequencies and bandwidths. An antenna designed for distant reception of low VHF signals will most likely not have sufficient gain to receive distant UHF signals. This fact explains the widespread usage of multiple element antenna systems with, for example, both log-periodic and bow-tie elements. Due to its unique properties, the DiSA™ antenna operates efficiently across a wide frequency band. We are currently using prototype models which demonstrate wide tunable bandwidth. One typical example proved usable from 50 MHz to over 800 MHz. Thus the consumer will need only one DiSA™ antenna regardless of ultimate broadcaster channel elections.

The DiSA™ antenna can be "pointed" to virtually any azimuth entirely by controlling internal switches – the antenna does not physically move. This azimuthal selection can be accomplished in milliseconds. This feature re-enables the viewer to channel surf as he no longer needs to get up to adjust the antenna each time he hits a button on the remote. In essence, the DiSA™ finally brings the convenience of the remote control to OTA DTV. The DiSA™ antenna thus avoids both the added expense of a rotor mechanism and the consumer effort of manual pointing.

The DiSA™ antenna form factor is amenable to indoor or outdoor mounting. The "standard model" today is a flat, rectangular package about 60 cm by 40 cm (approximately 23 inches by 16 inches) on a side and only 10 cm (less than two inches) thick. The DiSA™ antenna technology can be even be non-planar. We ask the Commission to note that indoor mounting necessarily implies lower gain and also entails yet another level of variability due to the various construction materials that might be encountered such as the wire plaster backer used in many older, exurban homes.

Viamorph believes that the term 'performance' should not be limited to strictly technical characteristics but should also include considerations of price, convenience, range of applicability and so on.

Concluding Comments

We believe that any predictive model must include methods to account for the wide and frequently unpredictable performance of the antennas available to consumers. It is our opinion that an accurate model would have to encompass extremely detailed geographical, botanical, atmospheric and other data. Due to the complexity and the lack of data such an effort seems impracticable. If such a model could be created, we estimate the uncertainty would be on the order of 10 dB or more.

We are convinced that no model which does not account for, in some way, the receiving antenna characteristics, is doomed to make grossly inaccurate predictions. Supposing a model were to be created as in the above paragraph, coupling its uncertainty with the wide range of antenna operation and placement factors produces a model with such a great degree of uncertainty as to be essentially useless.

We are pleased to bring the fact of an entirely new antenna technology to the Commission's awareness. Viamorph will be happy to provide additional information at the Commission's request.

Respectfully submitted,

Peter Bradshaw

Submitted June 17, 2005

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REPLY COMMENTS OF THE ABC, CBS, AND NBC TELEVISION AFFILIATE ASSOCIATIONS

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July 5, 2005

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Summary

The comments filed in this proceeding come from a variety of industries potentially affected by the Commission's recommendations to Congress in this matter. Some parties urge the Commision to concentrate on developing a predictive model, but SHVERA only permits the Commission to *recommend* to Congress that it should adopt a predictive model, not implement one. Other comments show that digital reception performance is not based on the price or brand of DTV receivers and that there will soon be digital smart antennas that can instantaneously alter their electrical characteristics, including gain, orientation, and pattern. And several sets of comments show that the current digital signal intensity thresholds set forth in Section 73.622(e)(1) of the Commission's rules are the appropriate metric for determining digital service under SHVERA.

EchoStar, however, in a stab at the very heart of the distant digital network signal compulsory license scheme, disagrees with this conclusion about the adequacy of the current digital signal strength standards. But EchoStar's approach is deeply flawed.

The cumulative effect of all of the alleged shortcomings EchoStar claims to find with the current signal strength standards leads to absurd noise-limited field strengths: 101.5 dBu for low VHF, 98.6 dBu for high VHF, and 98.4 dBu for UHF. In other words, EchoStar would have the Commission believe that its current noise-limited field strengths for DTV are too low by 73.7 dB for low VHF, by 62.8 dB for high VHF, and by 57.6 dB for UHF! EchoStar's wholly fanciful digital signal strength standards are reminiscent of similar outlandish adjustments to the Grade B planning factors that EchoStar (and also the Satellite Broadcasting and Communications Association) proposed five years ago in ET Docket No. 00-90. Just as the Commission did five years ago in the analog context, it should reject EchoStar's "adjustments" to the DTV planning factors which form

the basis for the entire digital television transition.

The real cumulative effect of any legitimate concerns with the adequacy of the DTV planning factors amounts to less than 6 dB. But, as shown extensively in Network Affiliates' opening comments, there is a safety margin of 9 dB for low VHF, 9 dB for high VHF, and 6.6 dB for UHF already built into the planning factors if a real-world reception installation is assumed with a readily available consumer antenna and low-noise amplifier ("LNA"). The Commission has previously recognized that LNAs are typical in fringe areas, and the ATSC recommends their use for digital reception. Moreover, these safety margins include only the advantage in system noise figure due to the LNA and not any of the actual gain that the LNA can deliver to the receiver. If the 15 dB to 20 dB additional gain that the LNA provides to the signal is also taken into consideration, then it is plain that the current digital signal strength standards in Section 73.622(e)(1) are far more than adequate to ensure good-quality DTV reception.

EchoStar also makes a number of other assertions, each of which would essentially permit the misorientation of antennas, that, while not expressly affecting the digital signal strength standards themselves, would have a negative effect on local network stations by penalizing them for inappropriate factors and, consequently, shrinking their local service areas. None of these assertions has any merit. EchoStar's attempts to avoid the use of rotors or to not fully orient an antenna properly are bad engineering practice and contrary to the Commission's long-standing expectations.

For the foregoing reasons, Network Affiliates respectfully request that the Commission reject EchoStar's purported "adjustments" to the DTV planning factors and EchoStar's other suggestions that would thwart localism and shrink network affiliate service areas.

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REPLY COMMENTS OF THE ABC, CBS, AND NBC TELEVISION AFFILIATE ASSOCIATIONS

The ABC Television Affiliates Association, the CBS Television Network Affiliates Association, and the NBC Television Affiliates Association (collectively, the "Network Affiliates"), by their attorneys, hereby reply to the comments filed in response to the *Notice of Inquiry* ("*Notice*"), FCC 05-94, released on May 3, 2005, in the above-referenced proceeding.[1]

The comments filed in this proceeding come from a variety of industries potentially affected by the Commission's recommendations to Congress in this matter. Both DIRECTV, Inc. and the Consumer Electronics Association ("CEA") urge the Commission to concentrate on developing a predictive model.[2] However, as pointed out by both Network Affiliates and the National Association of Broadcasters ("NAB"), SHVERA, as enacted, requires distant digital network signal eligibility to be determined by a complex site testing scheme.[3] SHVERA only permits the Commission to recommend to Congress that it should adopt a predictive model, and both Network Affiliates and

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[1] Network Affiliates collectively represent approximately 600 local television stations affiliated with the ABC, CBS, and NBC Television Networks.

[2] *See* DIRECTV Comments at 2; CEA Comments at 1.

[3] *See* Network Affiliates Comments at 42-43; NAB Comments at 3-4.

NAB agree that the Commission should make such a recommendation, but, for the many reasons expressed in their comments, a predictive methodology should not be implemented until after the DTV transition is complete.[4]

In other comments, ATI Technologies, Inc. ("ATI") shows that digital reception performance is not based on the price or brand of DTV receivers, that current DTV receivers perform well in a wide range of even less than ideal reception conditions, and that, "soon, all DTV sets and receivers should perform at least as well as the most advanced equipment available today."[5] ATI's comments are fully consistent with the views expressed by Network Affiliates and NAB in their respective comments. Viamorph, Inc. informs the Commission of its development of a digital smart antenna that can alter its electrical characteristics, including gain, orientation, and pattern, as directed by DTV receiver-resident software performing virtually instantaneous signal analysis.[6] And the Association for Maximum Service Television, Inc. ("MSTV") shows that the current digital signal intensity thresholds set forth in Section 73.622(e)(1) of the Commission's rules are the appropriate metric for determining digital service under SHVERA, a conclusion with which both Network Affiliates and NAB concur.

EchoStar Satellite L.L.C. ("EchoStar"), however, disagrees with this conclusion about the adequacy of the current digital signal strength standards. Because EchoStar's various assertions stab at the very heart of the distant digital network signal compulsory license scheme, these reply comments focus on detailing why EchoStar's claims are seriously flawed.

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[4] *See* Network Affiliates Comments at 43-44; NAB Comments at 33-38.

[5] ATI Comments at 3, 9.

[6] *See* Viamorph Comments at 3-4.

I. The DTV Planning Factors Established Appropriate Signal Strength Thresholds for Reception of Real-World Broadcast Signals, and EchoStar's "Adjustments" Are Groundless

EchoStar's comments attack SHVERA's current requirements, and the Commission's current rules, concerning both digital signal strength standards in Section 73.622(e)(1) and site testing methodology in Section 73.686(d), in what amounts to a mud-slinging kitchen-sink approach. Presumably, EchoStar hopes that if any mud sticks to the sink, then it will have succeeded in shrinking local network stations' coverage areas, which, as Network Affiliates extensively demonstrated, is the antithesis of localism, which has always been the guiding principle at the core of the distant signal compulsory license.[7]

But EchoStar's approach is unfocused and deeply flawed. It appears to be intentionally unfocused in at least one way: The cumulative effect of all of the alleged shortcomings EchoStar claims to find with the current signal strength standards leads to absurd adjustments, as shown below. EchoStar's approach is also unfocused (either intentionally or unintentionally) in a second way in that it presents no concrete suggestions for Commission action. Close scrutiny of EchoStar's various claims shows that they are flawed and without merit, and, consequently, it is not surprising that EchoStar proffers no substantive solutions since there is no substance underlying the complaints.

If each of EchoStar's complaints about digital reception impairments affecting the signal intensity necessary to provide good-quality DTV reception were taken at face value, they would result in the additions to the Commission's DTV planning factors shown in Table 1.

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[7] *See* Network Affiliates Comments at 1-13.

EchoStar Proposed Additions to the DTV Planning Factors *Table 1*

Parameter	Channels 2 to 6	Channels 7 to 13	Channels 14 to 69
Current FCC Median Field Intensity	27.8	35.8	40.8
Indoor Antenna Penalty[a]	8	10	9
Increase to 99% Time Probability[b]	0.6	4.7	17.5
White Noise Enhancement[c]	2	2	2
Man-Made Noise[d]	30	13	0
Impedance Mismatch[e]	3	3	3
Receiver Sensitivity Adjustment[f]	2.6	2.6	2.6
Building Penetration Loss[g]	27.5	27.5	23.5
EchoStar Proposed Median Field Intensity	101.5 dBu	98.6 dBu	98.4 dBu

[a] Derived from 1979 ITS study cited by EchoStar for each band, rounded to nearest whole number.
[b] Figures for the high VHF and UHF bands are taken from EchoStar Comments; figure for the low VHF band is by linear extrapolation.
[c] Taken from EchoStar Comments.
[d] Figure for the low VHF band is taken from EchoStar Comments; figure for high VHF is extrapolated for mid-frequency of the band from 20 dB figure given at 137 MHz; figure for UHF is assumed to be 0 dB since EchoStar does not make an argument that man-made noise is problematic at UHF frequencies.
[e] Taken from EchoStar Comments.
[f] Taken from EchoStar Comments to be representative of the typical receiver across all channels.
[g] Figures are derived as the average of the figures given by EchoStar from a 1963 study in the New York City area.

As Table 1 shows, the cumulative effect of EchoStar's various "adjustments" would result in digital signal intensity thresholds of 101.5 dBu for low VHF, 98.6 dBu for high VHF, and 98.4 dBu for UHF. In other words, EchoStar would have the Commission believe that its current noise-limited field strengths for DTV are too low by 73.7 dB for low VHF, by 62.8 dB for high VHF, and by 57.6 dB for UHF. To achieve the field strengths that EchoStar apparently believes are necessary for DTV service, television stations, in order to replicate their Grade B coverage areas, would need to be broadcasting with more than 23 million times the power than they are permitted now in the low VHF band, more than 1.9 million times the power than they are permitted now in the high VHF band, and more than 575,000 times the power than they are permitted now in the UHF

band. The absurdity of these proposals is self-apparent. It is no wonder that EchoStar did not tally the results of its kitchen-sink approach.

EchoStar's wholly fanciful digital signal strength standards are reminiscent of similar outlandish adjustments to the Grade B planning factors that EchoStar (and also the Satellite Broadcasting and Communications Association) proposed five years ago in ET Docket No. 00-90.[8] Just as the Commission did five years ago in the analog context,[9] it should reject EchoStar's "adjustments" to the DTV planning factors which form the basis for the entire digital television transition.

EchoStar's various "adjustments" are discussed below.

Indoor Antenna Penalty and Building Penetration Loss. EchoStar claims that indoor antennas have far less gain than outdoor antennas and suggests that the DTV planning factors need to be adjusted for this disadvantage.[10] EchoStar cites earlier studies that purport to establish that the indoor antenna penalty is approximately 8 dB in the low VHF band, 10 dB in the high VHF band, and 9 dB in the UHF band.[11] EchoStar further points out that indoor antennas suffer not only from

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[8] *See* EchoStar Satellite Corporation Comments, ET Docket No. 00-90, at 17 (proposing that the median field intensity for Grade B should be 66 dBu for low VHF, 77 dBu for high VHF, and 84 dBu for UHF). *See also* Satellite Broadcasting and Communications Association Comments, ET Docket No. 00-90, at 3 (proposing that the median field intensity for Grade B should be 70.5 dBu for low VHF, 76.5 dBu for high VHF, and 92.75 dBu for UHF).

[9] *See Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, Report, 15 FCC Rcd 24321 (2000).

[10] *See* EchoStar Comments, Engineering Statement of Hammett & Edison (hereinafter "Hammett & Edison Statement"), at 3.

[11] *See* Hammett & Edison Statement at 4.

having less gain but are also subject to weaker signals due to attenuation from building penetration.[12] EchoStar suggests that building penetration losses may range as high as 25 dB to 30 dB in the VHF bands and 21 dB to 26 dB in the UHF band in cities such as New York.[13] Although there are certainly indoor antennas that do not suffer nearly the disadvantage EchoStar claims (for example, the Zenith Silver Sensor has an average gain of approximately 4 dB and, being indoors, also does not have up to a 4 dB line loss) and although EchoStar itself points to building penetration loss data that is on the order of 10 dB lower, it is not necessary to either accept or challenge EchoStar's data on these points, for EchoStar's claims with respect to indoor antennas and building penetration losses are simply irrelevant. The Commission has always assumed that homeowners would employ an *outdoor*, directional gain antenna for over-the-air reception of television signals. The *Notice* states that the DTV planning factors "presume that households will exert similar efforts to receive DTV broadcast stations as they have always been expected to exert to receive NTSC analog TV signals."[14] OET 69 states that the planning factors are "assumed to characterize the equipment, including antenna systems, used for home reception."[15] And even EchoStar itself concedes that the digital signal strength standards "are predicated on the use of an *outdoor* antenna."[16] In short, EchoStar has provided no justifiable grounds to overturn an essential element that characterizes the digital replication and transition schemes. This attempt to rewrite the Commission's digital standards is particularly egregious in light of the necessity to locate a Dish Network satellite dish

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[12] *See* Hammett & Edison Statement at 13.

[13] *See* Hammett & Edison Statement at 13.

[14] *Notice* at ¶ 6.

[15] OET 69 at 3.

[16] Hammett & Edison Statement at 3 (emphasis added).

outdoors.

99% Time Probability. EchoStar's attempt to increase time probability to 99% from 90% is deeply flawed. EchoStar asserts that it takes an additional 4.7 dB to achieve F(50,99) at Channel 12 in the high VHF band and 17.5 dB at Channel 41 in the UHF band.[17] These adjustments are said to be derived from data collected at Hammett & Edison's offices. But neither EchoStar nor Hammett & Edison gives any information about how these data were purportedly collected. Significantly, Hammett & Edison claims that it collected data on "fourteen DTV signals that could be received at its Sonoma, California, offices," yet it only provides data for six of those signals.[18] What happened to the data from the other eight stations? Why was it excluded from public dissemination?

EchoStar's claim that 90% time reliability means that a viewer will not receive a digital picture for 36.5 days a year is nonsensical.[19] The statistical nature of the probability function means that any dips below the digital signal strength threshold will be randomly spaced over very long time periods. It has no meaning in the sense of a consecutive time period. EchoStar's assertion is akin to saying that if the weather forecast calls for a 10% chance of rain tomorrow, then it will rain for 2 hours 24 minutes tomorrow and it won't rain for the remaining 21 hours 36 minutes. Obviously, that is not what the weather forecast or the probability of rain means at all.

Finally, and most importantly, the entire DTV replication and transition scheme is predicated

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[17] *See* Hammett & Edison Statement at 7.

[18] *Compare* Hammett & Edison Statement at 6 (stating that data was collected on 14 DTV signals) *with id.* at Figures 1A-1C (exhibiting data on 6 DTV signals).

[19] *See* Hammett & Edison Statement at 7.

upon F(50,90) service. This is clear in the DTV proceedings[20] and in OET 69[21] and is expressly acknowledged by EchoStar.[22] Moreover, F(50,90) is currently being used for DTV spectrum repacking and maximization. Not only would it be grossly unfair to change the statistical nature of digital television service in the seventh inning, but such a change to 99% time probability would greatly shrink local service areas and, therefore, would be directly contrary to SHVERA's purpose to preserve and promote localism and to the requirement that compulsory licenses be construed narrowly, not expansively.[23]

Man-Made Noise. EchoStar claims, relying on an NTIA report, that man-made noise is typically 20 dB and, in urban areas, is typically 30 dB near 54 MHz (Channel 2). EchoStar further speculates that "[t]he increasing use of electrical and electronic equipment in the U.S. suggests that current noise levels could become much greater."[24] EchoStar has misrepresented what the NTIA report says. Rather, the NTIA report cited by EchoStar found man-made noise at 137 MHz, which is between the low VHF and high VHF bands, to be 17.5 dB in business areas and *only 3.6 dB in residential areas.*[25] At UHF frequencies (402.5 MHz and 761 MHz), it was not possible to differentiate man-made noise from system noise, showing that man-made noise is insignificant in

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[20] *See, e.g., Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, Sixth Report and Order, 12 FCC Rcd 14588 (1997) ("*Sixth DTV Report and Order*"), at Appendix A & Appendix B.

[21] *See* OET 69 at 2.

[22] *See* Hammett & Edison Statement at 7 (stating that the "F(50,90) statistical reliability is stated in the FCC planning factors for DTV").

[23] *See* Network Affiliates Comments at 2-13.

[24] Hammett & Edison Statement at 10.

[25] *See* R.J. Achatz & R.A. Dalke, *Man-Made Noise Power Measurements at VHF and UHF Frequencies*, NTIA Report 02-390 (Dec. 2001), at 25.

the UHF band.[26] An earlier 1998 NTIA report found that "residential F_{am} [man-made noise] has *decreased dramatically.*"[27] Therefore, contrary to EchoStar's assertions, man-made noise is not becoming greater, and is certainly not becoming greater than 30 dB or even 20 dB, but, instead, man-made noise is actually *decreasing* in residential areas, amounting to no more than 3 or 4 dB at VHF frequencies, and is insignificant at UHF frequencies. Of course, it is in residential areas where people live.

EchoStar notes that the DTV planning factors include a system noise figure of 10 dB at VHF frequencies, which is comprised of 5 dB for receiver noise and 5 dB for environmental noise.[28] The 2001 NTIA report shows that man-made noise at VHF frequencies is within the planning margin (as it also is at UHF frequencies).

Moreover, even EchoStar concedes that "[l]ow-band VHF stations will probably represent a small fraction of all DTV stations."[29] In fact, only 26 stations affiliated with one of the Big 4 networks have been given a DTV tentative channel designation in the low VHF band.[30] EchoStar's concern appears to be that some of these very few stations "may include large rural land areas,"[31] but those are precisely the situations in which the stations are likely to utilize translator and booster

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[26] *See id.*

[27] R.J. Achatz *et al.*, *Man-Made Noise in the 136 to 138-MHz VHF Meteorological Satellite Band*, NTIA Report 98-355 (Sept. 1998), at 31 (emphasis added).

[28] *See* Hammett & Edison Statement at 10 n.28.

[29] Hammett & Edison Statement at 10.

[30] This analysis is based on the DTV tentative channel designations released by the Commission on June 23, 2005. *See DTV Tentative Channel Designations for 1,554 Stations Participating in the First Round of DTV Channel Elections*, Public Notice, DA 05-1743 (June 23, 2005).

[31] Hammett & Edison Statement at 10.

stations to augment their service coverage.

In sum, EchoStar provides no evidence to adjust the digital signal strength standards, even for low VHF, due to man-made noise. Just as the Commission had done in 2000 for analog, it should not recommend any revision to the DTV planning factors based on environmental noise.[32]

White Noise Enhancement, Impedance Mismatch, and Receiver Sensitivity. Unlike the indoor antenna penalty, building penetration loss, 99% time probability, and man-made noise adjustments to the digital signal strength standards that EchoStar appears to propose—each of which it is inappropriate to consider, as shown above—EchoStar raises concerns about white noise enhancement, impedance mismatch, and receiver sensitivity that do have legitimate relevance to whether good DTV reception is possible with the digital signal strength standards set forth in Section 73.622(e)(1). Although the concerns are legitimate, EchoStar's adjustments for these factors tend to lie on the high side but, more importantly, fit within the "safety margin" that already exists in the current planning factors given real-world reception conditions and equipment.

White noise enhancement is the additional noise created in the DTV receiver when the equalizer compensates for multipath ghosts. EchoStar notes that at a "good" receiver location, the white noise enhancement necessary to handle multipath is "less than 0.5 dB," but, "at a poor location, the white noise penalty may exceed 2 dB."[33] However, there is no reason to assume that even a majority of the locations are "poor." A more typical value for moderate multipath conditions with moderate ghosts is around 1 dB. Just as the Commission should not assume the need for a time

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[32] *See Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, Report, 15 FCC Rcd 24321 (2000), at ¶ 52.

[33] Hammett & Edison Statement at 9.

probability of 99%, it should not assume the need for substantial white noise enhancement.

EchoStar presents data that it claims show that the typical DTV receiver is 2.6 dB less sensitive than assumed by the DTV planning factors.[34] However, of the four consumer receivers apparently tested, one, the RCA DTC100, is clearly an older model of either the first or second generation. The other three are either third or fourth generation receivers. None of them was a current fifth generation receiver. The sensitivity of the older model was noticeably worse than that of the other three. Excluding the early generation receiver, then, the average sensitivity, according to EchoStar's own data, is only about 1.7 dB less than assumed by the DTV planning factors, not 2.6 dB. It is believed that the sensitivity of fifth generation receivers nearly matches that assumed by the planning factors.

It is true that the DTV planning factors do not account for impedance mismatch between the antenna and the receiver front end. EchoStar claims that the Voltage Standing Wave Ratio (VSWR) exceeds 2:1 over the bandwidth of consumer antennas, resulting in an impedance mismatch loss of 3 dB.[35] This claim, however, is not based on empirical studies of consumer equipment. One study, which, unfortunately, did not fully present its results, did conclude as follows:

> The results of the tests conducted on the professional-grade antennas show that it is technically possible for antennas to have low return loss and mismatch loss. It is, therefore, reasonable to conclude that consumer-grade antennas with good impedance matching capabilities are feasible. Such antennas would help deliver full coverage to DTV stations.[36]

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[34] *See* Hammett & Edison Statement at 13.

[35] *See* Hammett & Edison Statement at 11-12.

[36] D. Schnelle & R.E. Wetmore, *Evaluation of Antenna and Receiver Mismatch Effects on DTV Reception*, 48 IEEE TRANS. ON BROADCASTING 365, 369 (Dec. 2002).

While a 3 dB impedance mismatch loss may be an approximate rule-of-thumb, further study is necessary to determine how accurate it is. It is technically possible that any mismatch could be considerably lower.

In any event, a typical white noise enhancement of 1 dB, an adjustment of 1.7 dB or less for receiver sensitivity not meeting DTV planning assumptions, and an impedance mismatch loss of 3 dB have a cumulative effect of less than 6 dB. As shown extensively in Network Affiliates' opening comments, there is a safety margin of 9 dB for low VHF, 9 dB for high VHF, and 6.6 dB for UHF already built in to the planning factors if a real-world reception installation is assumed with a readily available consumer antenna and LNA.[37] Those safety margins, it must be noted, include only the advantage in system noise figure due to the LNA and not any of the actual gain that the LNA can deliver to the receiver. If the 15 dB to 20 dB additional gain that the LNA provides to the signal is also taken into consideration, then it is plain that the current digital signal strength standards in Section 73.622(e)(1) are far more than adequate to ensure good-quality DTV reception. As Network Affiliates demonstrated in their opening comments, the Commission has previously recognized that LNAs are typical in fringe areas, and the ATSC recommends their use for digital reception.[38]

In sum, as Network Affiliates, NAB, and MSTV all showed in their comments, the DTV planning factors are appropriate for DTV replication and for SHVERA purposes. There is no need to recommend to Congress the alteration of the digital signal strength thresholds set forth in Section 73.622(e)(1) of the Commission's rules. EchoStar has presented no evidence that

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[37] *See* Network Affiliates Comments at 15-33 & Table 2.

[38] *See* Network affiliates Comments at 24-25.